Level 1 Validation Summary Notes

This document includes detailed notes about utility practices as reviewed during third-party level-one water audit validation.

This document is not a required submission to the California Department of Water Resources. It is meant to provide background and documentation of the validation process.

Call Information

Utility	**Validator: Amit Sharma, AQUATRAX**
Utility Name: City of Redding CY2020 Utility Participants: Candice Bailey-Marlar- Water Conservation Specialist, Josh Watkins – Water Utility Manager Call Date: 5/24/2021, 5/26/2021 6/14/2021,6/15/2021	Validator Qualifications: Water Audit Validator Certificate from the AWWA California Nevada Section

APPENDIX A: Level 1 Validation Notes Template

Pre-Interview Notes	All the required and supporting documentation was provided by the city staff. **REQUIRED ITEMS** • Complete AWWA Free Water Audit Software • Volume from Own Sources volumes by month by finished water supply meter • Water Imported volumes by month by import connection • Water Exported volumes by month by export connection • Metered Consumption volumes by month and rate code (e.g., charge status, water type, customer class) • Supply Meter Testing and/or calibration documentation if conducted

Level 1 Validation Summary Notes Template

Validation Call Notes

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
Volume from Own Sources (VOS)	Supply meter profile: All 17 wells are metered. Both the treatment plants are metered before the raw water enters the TP. Few wells may not be functioning all the time. All meters capturing inputs into the 6-supply retail zone. Wells water only gets chlorinated and does not go through the TP. All the production flow is metered before entering the TP. No plans to do the metering after the TP. Gravity flow 4 MG reservoir to the distribution system. Buckeye Water Treatment Plant BWTP – gets source water from whiskey town lake via spring creek tunnel Gravity flow from 4MG reservoir to the Keswick vault. Foot Hill Water Treatment Plant FWTP – gets source water from Sacramento River and is the main treatment plant. Enterprise and cascade increase during summer when the demand ramp up. Enterprise and Cascade SP Pump house – Raw water we pump out of river and directly sent to golf course, It does not enter our system at all and is not treated. It should not be included in the total. Storage and tank levels were equal at the start and end of the calendar year 2018. Some wells are on standby. Wells break down data is in separate sheet. Cypress Avenue vault is just the flow station and is not production meter. They are planning to replace it with the pump station project. Volumetric test only at BWTP. The only place they have ability to test is BWTP. Out of 20 meters only 1 was Volumetric tested. All 20 tested for electronic calibration testing. No plans to expand volumetric as it is exceedingly difficult to do except BWTP. VOS Input Data Source: 17 Wells, 2 TP (BWTP, FWTP) Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed. ACID is irrigation district partially in the city of	Percent of VOS metered: 100% Signal calibration frequency: 100% of the available wells Volumetric testing frequency: Annual (BWTP and FWTP) Volumetric testing method: For some meters only Percent of VOS tested and/or calibrated: 100% Comments: Volumetric is not performed at all source meters. Only performed at BWTP as it is not possible for other production meters. Recommended to expand testing to further improve DVG. City test the current flow calibration to the factories original calibration files that were stored in the device at the time of flow calibration back at the factory, this assures the unit has remained accurate over time. City just sent the calibration equipment back to the factory for testing and recertification last year. Also city staff checks the accuracy of the analog signal going back to SCADA for our trending purposes for reports and such semi-annually, one at the time of flow testing at the end of the year and the other about six months later. Ewell 3A, 4, 6A,11,12, 13,14 may not be tested as they may not be functioning/running at that time. Ewell 14 is the prop meter in 2018. See the testing procedure on the prop. Only Passed were 8,9,10,23. Ewell 7 was tested but no results. Cypress is not production meter. They will replace it soon. Test results within the +/- 1% accuracy error range. Confirmed DVG: 7

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
	Redding. 500 AF Water comes out from Sacramento River from PS1 and goes through the FWTP. It is treated as VoS and not Imported water as it comes out from the own sources and gets treated. Just to help the neighboring district financially there is a contract in place for many years to buy 500 AF every year. Confirmed input value: 26,141.870 acre-ft/year	
VOS Master Meter Error Adjustment	Adjustment Basis: Meter-specific test results. Net Storage Change Included: Yes Comments: No under or over registration reported. We read the meters either of the SCADA or manually. SCADA reads are good. Continuously record the reading. Source data is reviewed daily. Confirmed input value: 0%	Supply meter read frequency: Daily Supply meter read method: SCADA automatically and manually Frequency of data review: Daily Storage level monitoring frequency: Daily Comments: Verify daily and if find error fix daily. Quality check is there. Tank level are monitored daily. Supply meter read is daily. 17 Wells data is logged manually instead of continuous electronic SCADA logging. BTWP and FWTP are logged continuously. Confirmed DVG: 8
Water Imported (WI)	Import meter profile: Metered at City of Shasta Lake WI Data Source: TOYON, City of Shasta Lake Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed. Volume is very small compared to own sources Confirmed input value: 23.710 acre-ft/year	Percent of WI metered: 100% Signal calibration frequency: 100% Volumetric testing frequency: Annual Volumetric testing method: No Percent of WI tested and/or calibrated: 100% Comments: Summit city subzone gets treated water from TOYON, it is already treated from city of Shasta Lake and City of Redding just buy from them, so it is considered as Imported Water. It was originally accounted in the VoS but during Audit process we moved it under the Imported Water section.

Level 1 Validation Summary Notes Template

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
		Confirmed DVG:7
WI Master Meter Error Adjustment	Adjustment Basis: Meter-specific test results Comments: Volume is very small compared to own sources Confirmed input value: 0%	Import meter read frequency: Continuous Import meter read method: SCADA Automatic reading Frequency of data review: Daily Comments: It is only 1 import meter from City of Shasta Lake. The treated water is sent to City of Redding from City of Shasta Lake. Confirmed DVG:9
Water Exported (WE)	Export meter profile: Inter-tie meters read monthly. It is shipped to Bella Vista or City of Shasta Lake. There are around 7 of export interties. WE Data Source: Keswick, Centerville, City of Anderson, City of Shasta Lake, BVWD, City of Shasta Lake. Volume is very small compared to own sources Comments: Cypress Avenue vault is just the flow station and is not production meter. They are planning to replace it with the pump station project. Confirmed input value: 79.9 acre-ft/year	Percent of WE metered: 100% Signal calibration frequency: Annual Volumetric testing frequency: Annual Volumetric testing method: Some Percent of WE tested and/or calibrated: 100% Comments: City of Redding is not in the business of exporting. They export when neighboring water districts needs it for immediate emergency or short-term use. Total of 7 export meters are there. Confirmed DVG: 9
WE Master Meter Error Adjustment	Adjustment Basis: Meter-Specific test results	Export meter read frequency: Daily Export meter read method: Manual Daily Frequency of data review: Daily

Level 1 Validation Summary Notes Template

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
	Comments: Volume is very small compared to own sources Confirmed input value: 0%	Comments: Not tested recently. Volume is very small compared to own sources Confirmed DVG: 9
Billed Metered Authorized Consumption (BMAC)	Customer Meters & Reads Profile: - Age profile: how many years old? (1960's to current) - Reading system: Billing cycle is monthly. - Read frequency: Monthly. Billing Data Pro-rated? No Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable confirmed. No AMI at this time. Monthly reads are available. Itron meters. For billing they use vertex. Plus there is ~2.3 AF difference in the files vs the audit sheet. It could be a rounding error. If meter reader staff cannot read the meter, they create the service order and re-read it. Smaller meters residentials this happens sometimes. They read and replace the meter also. Scratch on the glass, fog glass. 90% are read visually. Service order is created right away, next day CS person will go out and read it. Replace register or replace meter.	Percent of customers metered: 100% Small meter testing policy: Based on aging of the meters. Customer complaints on accuracy and then meter is replaced. Most of the time meter is running slow. Correct from that point on, no back bill. Pull them out, test it, but replace it as cost of labor ($30/hour) is more than cost of meter $45. Older ones are not lead free so they cannot re-install anyway. Number of small meters testing/year: 5/8, 3/4 are the ones which are old. Approx. 1000 meters are replaced every year. Replace smaller meters as they are only $45. Large meter testing policy: Large meters 3" and large are tested every 2 years. It is pro-active testing. Number of large meter tested/year: Probably around 90 Meter replacement policy: small ones are replaced and large ones are tested. Number of replacements/year: 1000 or approx.3% Billing data auditing practice: Both City and Customer Billing department does Annual audit every October policy.

Level 1 Validation Summary Notes Template

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
	Confirmed input value: 23,626.060 acre-ft/year	Comments: No recycle or raw water in the system. Water quality is better than other parts of the states so water meters last longer. Billing data had SP Pump house 90.38 AF in there which is raw water sent to golf course. During review process it was taken out from BMAC total. 2019 was relatively more wetter(rain) year so consumption was probably lesser than 2018. Confirmed DVG:8
Billed Unmetered Authorized Consumption (BUAC)	Billed Unmetered Profile:n/a Input Derivation: n/a Comments: n/a Confirmed input value: 0 acre-ft/year	Policy for metering exemptions: n/a Comments: No customers of type BUAC Confirmed DVG: n/a
Unbilled Metered Authorized Consumption (UMAC)	Unbilled Metered Profile: Flushing, Hydrant testing, plant uses. Input Derivation: Metered and usage is logged. Comments: none Confirmed input value: 80.715 acre-ft/year	Policy for billing exemptions: None Comments: none Confirmed DVG: 8
Unbilled Unmetered	Unbilled Unmetered Profile: Fire, Theft, Plant uses, evaporation.	Default or Adjusted Default Applied: California Adjusted default 0.25%

Level 1 Validation Summary Notes Template

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
Authorized Consumption (UUAC)	Input Derivation if Estimated: California adjusted default of 0.25% of Water Supplied Comments: Confirmed input value: 65.214 acre-ft/year	Completeness of Documentation: Yes Comments: Confirmed DVG: 5
Unauthorized Consumption (UC)	Default Applied? Yes Input Derivation if Customized: n/a Comments: Confirmed input value: 59.065 acre-ft/year	Instances and extent of UC documented: Comments: default grade applied Confirmed DVG: 3
Customer Metering Inaccuracies (CMI)	Input Derivation: Meters are reading within 2% accuracy. Comments:	Characterization of meter testing: Based on customer complaints for smaller residential meters and larger ones are tested pro-actively. Based on aging of the meters. Customer complaints on accuracy and then meter is replaced Characterization of meter replacement: Small Meter Replacement Program in place for testing and replacement of 5/8 and 3/4

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
	Confirmed input value: 483.812 acre-ft/year	meters for all meters 25 years or older. Meters consistently test within 2%. Comments: Confirmed DVG: 7
Systematic Data Handling Errors (SDHE)	Input Derivation: Used default 0.25% Comments: default input applied. Confirmed input value: 59.065 acre-ft/year	If custom estimate provided n/a Characterization of read collection & billing process: Characterization of billing process and billing data auditing: Confirmed DVG: 3 (default grade)
Length of Mains	Input Derivation: Derived directly from Main's inventory (GIS, ledger, etc) Hydrant lateral length included: Yes Comments: Confirmed input value: 567.0 Miles	Mapping format: GIS database Asset management database: Not for the pipe length Map updates & field validation: Yes. Comments: City of Redding has a detailed, comprehensive GIS database that is updated regularly. Confirmed DVG: 10

Level 1 Validation Summary Notes Template

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
Number of Active and Inactive Service Connections	Input Derivation: CIS Billing system Basis for database query: n/a Comments: Confirmed input value: 30,073	CIS updates & field validation: Yes Estimated error of total count within: <1% Comments: Even though 2019 had 237 more connections still billed consumption was less than 2018 and the reason may be due to 2019 more wetter (rain) year than 2018 so probably consumption was less. Confirmed DVG: 10
Average Length of Customer Service Line	Are customer meters at the curbstop? Yes Where are customer meters installed if not at curbstop? n/a Customer service line derivation Comments: Confirmed input value: Yes	Comments: Confirmed DVG: 10
Average Operating Pressure	Number of zones, general setup: There are 9 pressure zones Typical pressure range: 60-165 psi Input derivation: Physical/Manual Pressure recording Comments: Pressure is estimated weighted average. Confirmed input value: 80	Extent of static pressure data collection : Beyond the boundary points. Characterization of real-time pressure data collection: Some Manual random logging. Basic telemetry set up. Hydraulic model in place? Calibrated? In place. Within the last 2 years it was calibrated. Comments: Average is 90.1 psi. It is not a weighted average. So, they took weighted average 80. That is why data validity grade is low as city does not have accurate number.

Level 1 Validation Summary Notes Template

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
		Confirmed DVG:5
Total Operating Cost (TOC)	Input Derivation: From official financial department. Electronic accounting system. Comments: Confirmed input value: $ 20,740,457/year	Frequency of internal auditing: Annual Frequency of third-party CPA auditing: Annual Comments: It comes from Finance department. Annual cost. Confirmed DVG: not available in 2020 v6.0
Customer Retail Unit Cost (CRUC)	Input Derivation: Simple flat rate. Rate is derived from cost of supplying and delivering water. Sewer Charges Volumetric? n/a Sewer Charges Included? n/a Comments: Rate approved by council. Prop 218 rate adjustments. Confirmed input value: $1.41/CCF	Characterization of calculation: Comments: Single volumetric rate exists for all customer classes. So even though no official third-party review has been conducted and confirmation of rate structure suffices for a DVG of 10. Confirmed DVG: 10
Variable Production Cost (VPC)	Supply profile: Non weighted average of multiple sources was used. Direct variable costs included: Yes Secondary costs included: Yes Comments: Fixed costs are excluded.	Characterization of calculation: Comments: Power and chemicals - Cost to pump , treat and deliver the water. Audit is done periodically less than annually.

Level 1 Validation Summary Notes Template

Audit Input	Confirmation of Input Derivation	Confirmation of DVG Assignment
	Confirmed input value: $231.56/acre-feet	Confirmed DVG: 4
Pending Items needed to complete the validation	1) Meter testing results for Import and Export meters.	